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Examination of the most important red wine grape varieties of the Miniş (Ménes) wine region based on their quantitative and qualitative parameters

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Abstract: Winemaking has a very old history, which goes back thousands of years in the past. Numerous countries and geographical regions are known and acknowledged for their winemaking history. In Romania, there are countless winemaking regions that produce high-quality red and white wines. In the present experiment, we measured the quantitative and qualitative parameters of two red wines manufactured from worldwide-known varieties (Cabernet Sauvignon and Merlot) and two red wines produced from traditional grape varieties (Cadarcă/Kadarka and Fetească Neagră/Fekete Leányka). The data were collected in three different years to see if the traditional varieties could compete with the worldwide-known varieties. In terms of wine quality parameters, looking at total acidity, the Cabernet Sauvignon in 2018 while in terms of alcohol content the Fetească Neagră/Fekete Leányka in 2017 showed the highest values. From the sensory examination, it could be concluded that Fetească Neagră/Fekete Leányka yielded the best results in 2017, in 2018 the Cadarcă/Kadarka, and in 2019 the Merlot variety.

Keywords: winemaking, anthocyanin, acidity, sugar, alcohol, traditional varieties

1. Introduction

Wine is a worldwide-known beverage with a tradition of thousands of years. It had always played an important role for humanity. Numerous research studies demonstrate its beneficial effect on health due to its phenolic compound [1, 2]. Also, a beneficial property is that it can improve the human body's antioxidant defence status, and it can even lower oxidative stress [3, 4, 5].

Nowadays, due to advanced winemaking technologies and the use of specific vineyards, the quality of wine has improved significantly [6, 7, 8]. Wine quality mostly depends on its chemical composition, and with red wine technology, quality is strongly related to the amount and type of polyphenolic compounds [9]. The polyphenolic compound plays an important role in improving wine colour intensity and stability, the structure and the mouthfeel of the wine, as well as their ageing potential [1]. Furthermore, the polyphenolic compound in wine could be greatly beneficial to human health [10]. It has been demonstrated in several studies that the phenolic compound has a major effect on the human body [1], and it is proved that it helps in reducing all-cause mortality risk [11], prevents cardiovascular diseases [12], diabetes [13], and improves cognitive functions [14]. The determination of grape varieties and their composition is also an important step [15, 16].

Romania has a suitable climate for grape growing, and viticulture is a traditional occupation [17, 18]. This is the reason why Romania is one of the main wine-producing countries of the world. It has 192,000 ha of vine plantation with a production of about 5 million hL/year [19]. Besides the well-known international varieties, we can find autochthonous grape varieties in each Romanian wine region such as Fetească Neagră/Fekete Leányka or Cadarcă/Kadarka [20].

2. Materials and methods

The experiment was carried out in Păuliş (Ópálos), which is 26 km distance from Arad, at the Balla Géza Winery and at the Miniş (Ménes) Viticulture and Winery Research Institute.

The Miniş (Ménes) wine region is in the western part of Romania, near Arad, and it is known as a good wine-producing region. It has a very good geographical location with suitable soil properties and weather for grape growing and wine production, especially for red wines. This favourable microclimate is provided by the River Mureş.

In October 2017, we examined the parameters of the already matured, stable wines made from four grape varieties: Cadarcă/Kadarka, Fetească Neagră/Fekete Leányka, Cabernet Sauvignon, and Merlot. We have used 24 L of wine to determine the parameters. All four wines were made with the same red wine technology.

Determination of total acid content

To determine the acidity, we titrated the wine samples with a strong alkaline-measuring solution. We used bromothymol blue until we reached the pH level of 7.

Determination of anthocyanin content

The measurement was carried out using a spectrophotometer, examining the colour absorption capacity of anthocyanins. The colour absorption capacity is directly proportional to the anthocyanin content. For the experiment, we used a Helios alpha spectrophotometer, a glass cuvette, and a pipette. The measurements were made at a wavelength of 520 nm.

Alcohol and sugar-free extract

To determine the alcohol content and the extract content, we used the Alex 500 alcohol and extract meter. We obtained the sugar-free extract content by subtracting the amount of sugar over 1 g from the total extract content.

Sensory examination

For the sensorial examination, the following scoring system was used:
Colour and clarity: 0–15 points;
Fragrance quality and intensity: 0–20 points;
Flavour and varietal character intensity: 0–40 points;
Total impression: 0–25 points;
The maximum possible score was 100 points.
At the sensory examination, four participants were present: Géza Balla, Gergő Nyilas, Gyula Besenyei, Iuon Nicolae. Scoring was based on a 100-point system.

3. Results and discussion

The total acid content of the wines produced from red wine grapes examined in the experiment

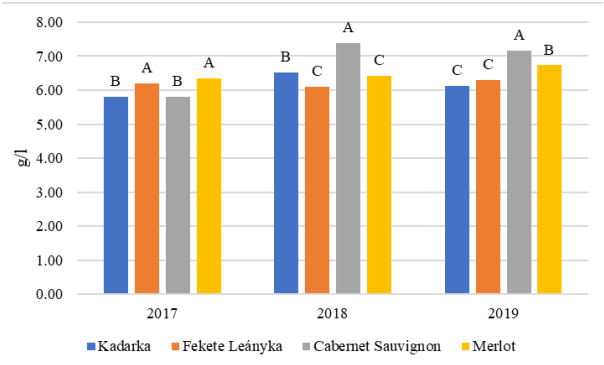

Figure 1. Total acidity content

From the titration of a sample taken from a 10,000-litre tank after malic acid decomposition for each variety, assessments were made.

We could clearly observe that in 2017 Merlot (6.34 g/L) had the highest total acid content, followed by Fetească Neagră/Fekete Leányka with 6.21 g/L total acid content and then Cadarcă/Kadarka and Cabernet Sauvignon with 5.81 g/L. In 2018, Cabernet Sauvignon showed the highest value with 7.39 g/L, while the lowest was measured in the sample from Fetească Neagră/Fekete Leányka, 6.10 g/L. In 2019, Cabernet Sauvignon had the highest total acid content of 7.16g/L, while on the other hand the lowest was measured for Cadarcă/Kadarka: only 6.12g/L (*Fig. 1*).

The anthocyanin content of the wines produced from red wine grape varieties examined in the experiment

Based on the data, it can be determined that Cabernet Sauvignon had the highest (955 mg/L) anthocyanin content in 2017 and Cadarcă/Kadarka the lowest in 2019: only 427 mg/L (*Fig. 2*).

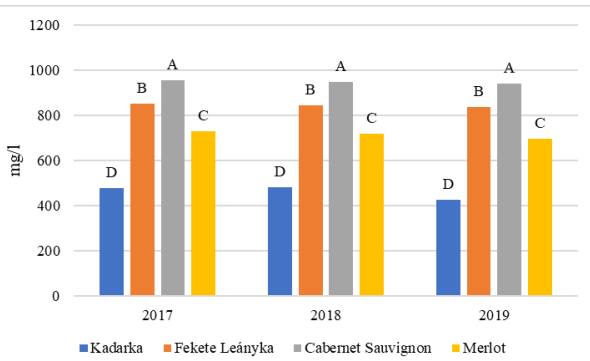

Figure 2. Anthocyanin content

The alcohol content of the wines produced from the red wine grape varieties examined in the experiment

Under our experimental conditions, we found that (*Fig. 3*) in 2017 Fetească Neagră/Fekete Leányka and Cabernet Sauvignon had similarly high alcohol content (Fetească Neagră/Fekete Leányka – 14.05%, Cabernet Sauvignon – 14.01%), Merlot a reduced alcohol content (13.33%), and Cadarcă/Kadarka approximately 13%. The 2018 wines had a slightly lower alcohol content due to less sugar; accordingly: the highest values were for Cabernet Sauvignon, 13.76%; Fetească Neagră/Fekete Leányka showed almost the same value, 13.64%, followed by Merlot with 13.10%

and Cadarcă/Kadarka with 12.71%. In 2019, the alcohol content of Fetească Neagră/Fekete Leányka was measured the highest, with 13.46%, followed by Cabernet Sauvignon with 13.22%, Merlot with 12.78%, and Cadarcă/Kadarka with 12.55%.

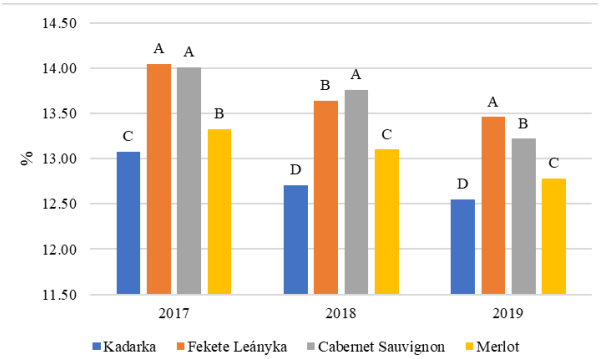

Figure 3. Alcohol content

The sugar-free extract content of the wines produced from red wine grape varieties tested in the experiment

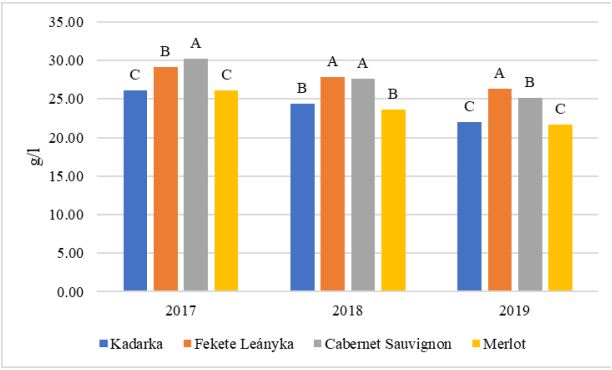

Figure 4. Sugar-free extract content

Considering the sugar-free extract content, in 2017, Cabernet Sauvignon had the highest sugar-free extract, 30.25 g/L, followed by Fetească Neagră/Fekete Leányka with 29.13 g/L, then Cadarcă/Kadarka with 26.15 g/L, and, finally, Merlot with 26.12 g/L. In 2018, the sugar-free extract values determined from Fetească Neagră/Fekete Leányka and Cabernet Sauvignon are almost similar (Fetească Neagră/Fekete Leányka: 27.82 g/L, Cabernet Sauvignon: 27.60 g/L), while Cadarcă/Kadarka and Merlot also showed lower values (Cadarcă/Kadarka: 24.42 g/L, Merlot: 23.65 g/L). In 2019, the sugar-free extract content of Fetească Neagră/Fekete Leányka was recorded the highest at 26.38 g/L, the sample from Cabernet Sauvignon was

25.14 g/L, the sample from Cadarcă/Kadarka was 22 g/L, while the sample from Merlot was 21.71 g/L (*Fig. 4*).

The average total scores of the sensory tests of the wines produced from red wine grape varieties examined in the experiment

In the sensory examination, the colour, purity, aroma quality and intensity, flavour and varietal character intensity, and the overall impression were scored (*Fig. 5*). The sensory test showed that Fetească Neagră/Fekete Leányka produced in 2017 scored the most points (90), followed by Cabernet Sauvignon and Merlot with 88 points, and Cadarcă/Kadarka the least with 87 points. For the wines produced in 2018, the participants' favourite wine was Cadarcă/Kadarka with 89 points, then Fetească Neagră/Fekete Leányka with 85 points, Merlot with 84 points, and the minimum points were reached by the Cabernet Sauvignon wine: only 82 points. In the year 2019, Merlot recorded the highest score with 89 points, followed by Cabernet Sauvignon with 88 points, Cadarcă/Kadarka with 87 points, and, finally, Fetească Neagră/Fekete Leányka wine only with 86 points.

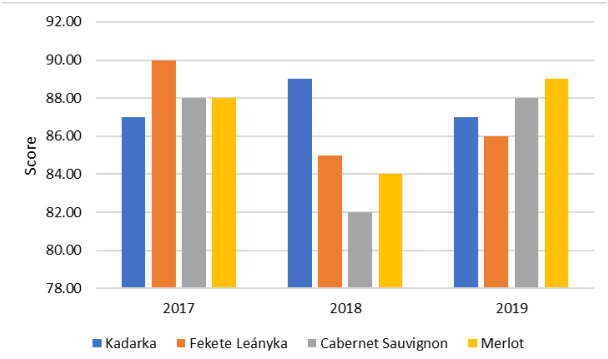

Figure 5. Sensory test score

4. Conclusions

From our data, it can be concluded that in terms of wine quality parameters, regarding the total acidity, in 2018 Cabernet Sauvignon (7.39 g/l) reached the highest content. Considering the alcohol content in 2017, Fetească Neagră/Fekete Leányka (14.05 %) showed the highest values.

During the sensory examination, Fetească Neagră/Fekete Leányka achieved the best results in 2017 (90 points), in 2018 Cadarcă/Kadarka (89 points), and in 2019 Merlot (89 points) were the most appreciated by the participants.

Based on the experiment, it can be stated that both traditional and worldwide-known varieties are suitable for making high-quality wines in the Romanian regions. Although the varieties selected for this work are not similar in different ways, the experiment presented here proves that traditionalism can and should be continued, as it is possible to create "gems" that will not be forgotten decades or even millennia later.

Acknowledgements

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